Space Weather Technical Forecast

Issued on Wednesday, 28 August 2024 at 12:27 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Isolated M-class flares and R1/R2 blackouts likely. Minor coronal hole influence possible Days 2 and 3 (29 and 30 Aug).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity was at Low levels with a peak C6.4 flare at 28/0845UTC from AR3801.

There are ten sunspot regions on the visible disc. The largest region on the disc, AR3800 (Ehi/Beta) in the southwest has decayed slightly with a loss of an intermediate delta spot and fading of some of the trailer spots. AR3801 (Hsx/Alpha) has exhibited decay, despite producing the largest flare of the period. Other notable regions include AR3796 (Dai/Beta) and AR3799 (Chi/Beta-Gamma), also in the southwest. Both have undergone decay, mainly in the trailing region of each with a subsequent reduction in flare activity. The remaining regions on the disc are either small or magnetically simple and mostly stable, however the new unnumbered region in the far southeast (Ex-AR3777) may reveal more complexity as it rotates further into view.

No Earth-directed CMEs were observed in the past 24 hours.

Solar Wind / Geomagnetic Activity: Solar wind parameters, as measured by ACE at L1, indicated ongoing influence from a CME that arrived early on 27 Aug. Despite this solar wind speeds were slow, varying between 275-362 km/s. The Interplanetary Magnetic Field (IMF), Bt, was initially Moderate (around 10nT) but increased from 27/2200 UTC following the onset of the CME flux rope to become Strong, with a peak of 17nT observed at 28/1130 UTC. The north-south component, Bz, varied erratically between north and south directions initially, at weak to moderate strength. A prolonged period of moderate to strongly negative (southward) Bz was observed 27/2200-28/0730 UTC (peak -15nT) before becoming predominantly weakly negative late in the period. Phi angle was initially negative (towards the Sun), then became generally positive (away from the Sun) between 27/1600-28/0200 UTC, before becoming negative (towards the Sun) thereafter.

Resultant Geomagnetic activity was initially Quiet to Unsettled (Kp2-3), but increased to reach G2/Moderate Storm (Kp6) levels between 28/0000-0300 UTC, before easing to Active (Kp4) to G1/Minor Storm (Kp5) levels from 28/0300-0900 UTC. Activity decreased to Quiet (Kp2) levels 28/0900-1200 UTC.

Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux observed by GOES18 remained at background. High energy electron flux (greater than 2MeV) observed at GOES16 was mainly at background, but did have a diurnal rise to moderate levels between 27/1200-1800 UTC. The 24-hour fluence was below the Active threshold, with 3.91e6 integrated pfu observed at 28/0000UTC.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Met Office Space Weather Technical Forecast

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is forecast with M-class flares likely and a slight chance of isolated X-flares occurring.

Solar Wind /Geomagnetic Activity: Ongoing CME influence from an arrival on 27 Aug is expected to decline in the coming 24 hour period. No other Earth-directed CMEs feature in the forecast. Mainly slow-ambient solar winds are expected during the period, however, minor fast wind influence to slightly elevated levels is possible on Days 2 and 3 (29 and 30 Aug).

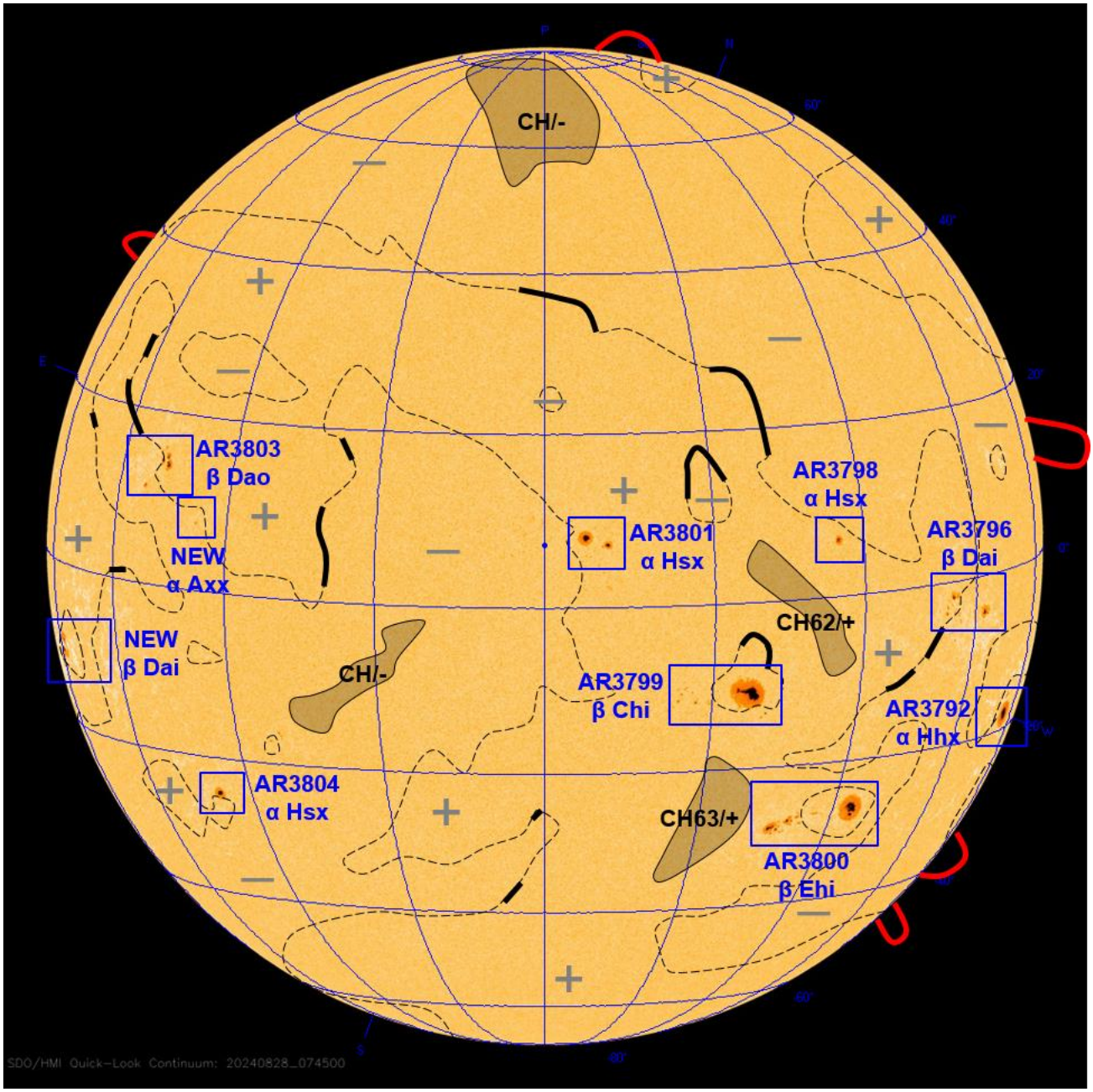
Geomagnetic activity is expected to be at Quiet to Unsettled levels, but with a chance of isolated Active intervals on Days 1 and 2 (28 and 29 Aug).

Energetic Particles / Solar Radiation: High energy proton flux is likely to remain at background, but with the potential to rise in response to any notable flares, giving a slight chance of reaching the S1 Minor Radiation Storm level. High energy electron flux is expected to remain at mainly background levels. The associated 24-hour fluence is expected to persist below the Active level.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Figure 1. Solar Analysis Valid 28/0745 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Geomagnetic Storms:

The CME that was seen leaving the sun on 23 Aug arrived at L1 early on 27 Aug. Earth currently lies within the magnetic flux rope from this feature, with enhanced solar wind parameters that are expected to ease in the next 24 hours. No other Earth-directed CMEs feature in the forecast.

Solar winds are at slow ambient levels and likely to continue at similar speeds through much of the forecast period. Coronal hole 62/+ west of centre disc may cause some slight enhancement to the solar wind on Days 2 and 3 (29 and 30 Aug), perhaps reaching slightly elevated levels. This coronal hole is a persistent feature on the disc, but forecast effects are considered somewhat uncertain due to contamination from previous CME impacts during the previous rotation on solar wind data. While MOSWOC ENLIL model predicts a slightly earlier enhancement on Day 1 (28 Aug), its forecast of a minor increase in solar wind is considered accurate. Another, larger coronal hole (63/+) in the southwest disc is likely too far south on the disc to result in any notable enhancement at Earth.

Geomagnetic activity is expected to be at Quiet to Unsettled levels, but with a chance of isolated Active intervals on Days 1 and 2 (28 and 29 Aug).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	5	5	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections – Nil

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Radio Blackouts - X-Ray Flares:

Flare activity is expected to be Low to Moderate, with M-class flares considered likely and a slight chance of isolated X-class flares occurring.

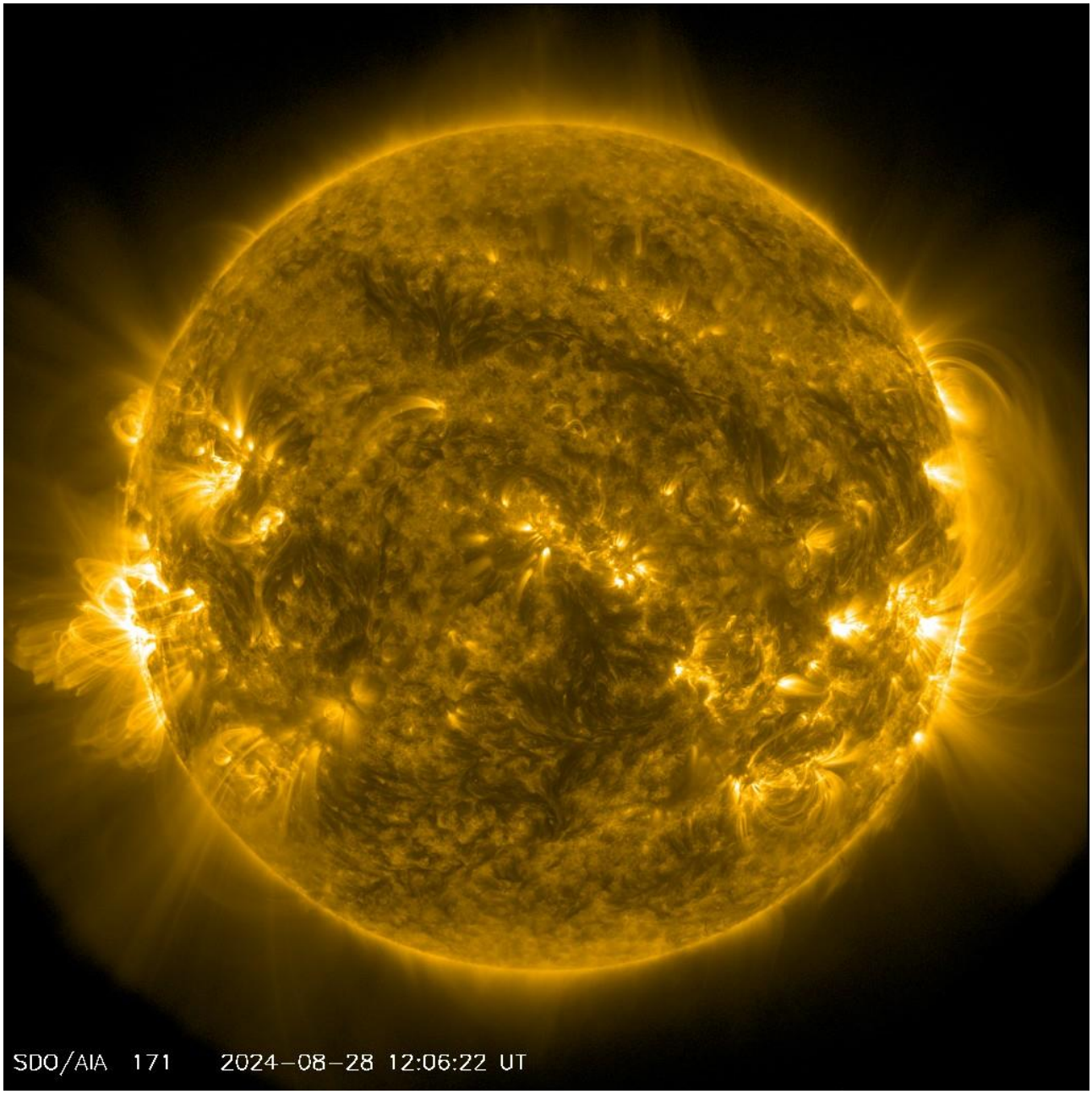
There are currently ten sunspot regions on the visible disc. AR3800, in the southwest quadrant, remains the most likely and notable flare source. It features a large symmetrical leading spot followed by a series of smaller mixed polarity spots, although has lost its weak delta spot within its intermediate portion. AR3799, also in the southwest is another large group, however, some simplification has taken place with decay of its trailer spots. AR3796 in the far southwest continues to decay with fading of its trailing spots. The remaining regions on the disc are either small or magnetically simple and mostly stable, however the new unnumbered region in the far southeast (Ex-AR3777) may reveal more complexity as it rotates further into view.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	65	65	65	65
Very Active	R3 to R5 X Class	No	10	10	10	10

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Figure 2: SDO AIA 171 imagery at 28/1206 UTC.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Solar Radiation Storms - (High Energy Protons):

High energy proton flux, as observed by GOES-18, is currently at background and expected to persist at this level. There are a number of moderately sized sunspot regions in the western hemisphere and moving into an increasingly favourable position to give proton enhancements at L1, should any significant flares occur. However, these regions currently lack complexity that is ordinarily associated with the more proton rich events. Consequently, the chance of seeing the proton flux rising or exceeding the S1 Minor Radiation Storm threshold is considered low through the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	10	10	10	10
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux as observed by GOES-16 is currently at background and forecast to remain at this level, although likely with some moderate diurnal fluctuations during the period.

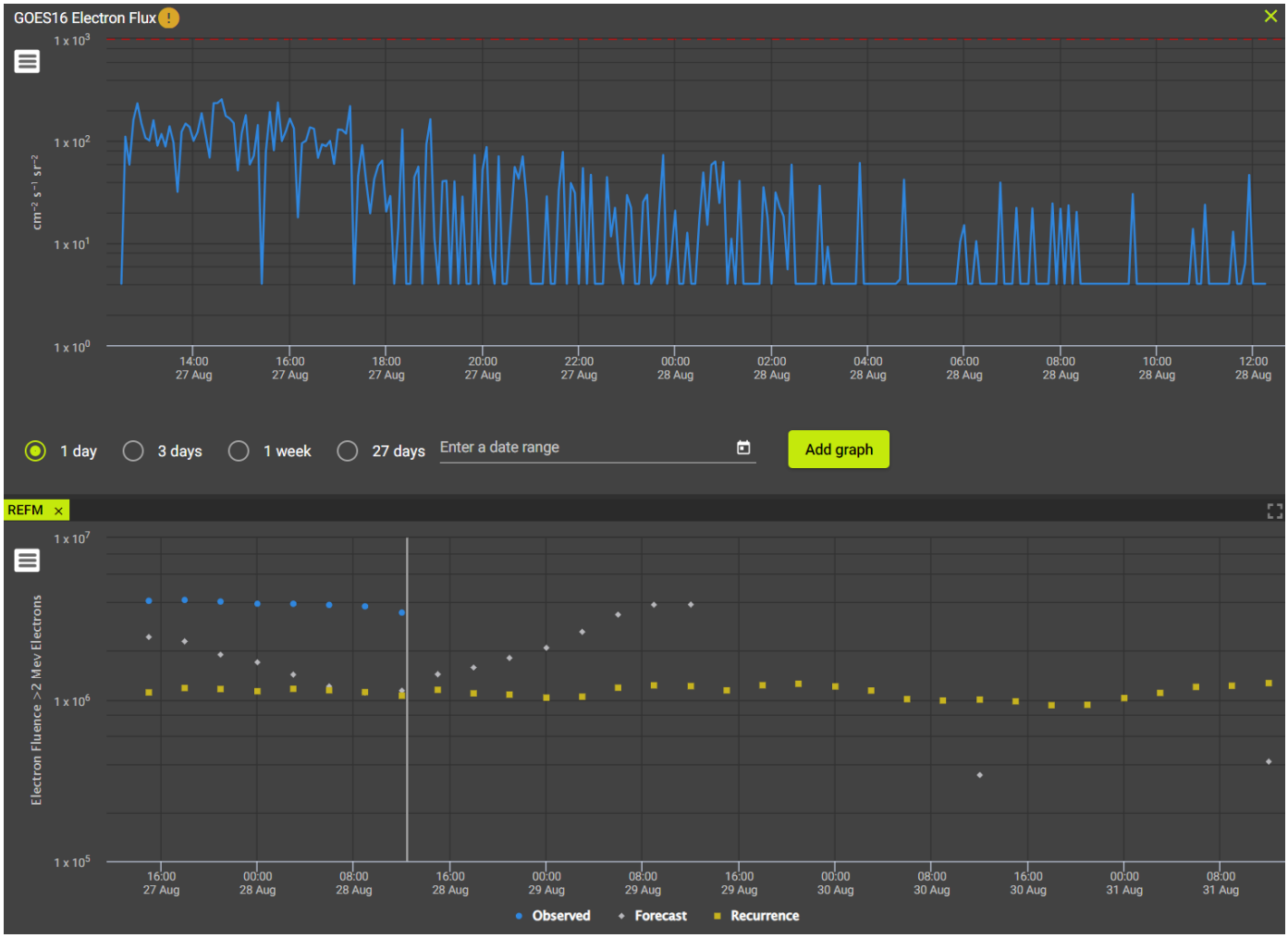
Fluence is expected to remain below the Active (1e8 integrated pfu) threshold through the period. MOSWOC REFM is currently underrepresenting electron fluence compared to observed values, but not significantly so.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Figure 3: Latest GOES-16 >2MeV Electron Flux (above) and MOSWOC REFM forecast with recurrence (below).



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.